

## PATENT COOPERATION TREATY

## PCT

REC'D 27 FEB 2006

WIPO



PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference Po030348ET	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. <b>PCT/KR2004/000760</b>	International filing date(day/month/year) <b>01 APRIL 2004 (01.04.2004)</b>	Priority date (day/month/year) 23 OCTOBER 2003 (23.10.2003)
International Patent Classification (IPC) or national classification and IPC <b>H01L 29/78(2006.01)i</b>		
Applicant <b>ELECTRONICS AND TELECOMMUNICATIONS RESEARCH INSTITUTE, ET AL. et al</b>		

- This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 4 sheets, including this cover sheet.
- This report is also accompanied by ANNEXES, comprising:
  - ☐ (sent to the applicant and to the International Bureau) a total of \_\_\_\_\_ sheets, as follows:
    - ☐ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
    - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
  - ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) \_\_\_\_\_ containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box relating to Sequence Listing (see Section 802 of the Administrative Instructions).
- This report contains indications relating to the following items:
  - ☒ Box No. I Basis of the report
  - ☐ Box No. II Priority
  - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - ☐ Box No. IV Lack of unity of invention
  - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - ☐ Box No. VI Certain documents cited
  - ☐ Box No. VII Certain defects in the international application
  - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand <b>23 MAY 2005 (23.05.2005)</b>	Date of completion of this report 25 JANUARY 2006 (25.01.2006)
Name and mailing address of the IPEA/KR  Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140	Authorized officer KIM, Dong Yup Telephone No. 82-42-481-5749 

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/KR2004/000760

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This report is based on translations from the original language into the following language \_\_\_\_\_ which is the language of a translation furnished for the purposes of:
    - ☐ international search (under Rules 12.3 and 23.1(b))
    - ☐ publication of the international application (under Rule 12.4)
    - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
  - ☒ the international application as originally filed/furnished
  - ☐ the description:
    - pages \_\_\_\_\_ as originally filed/furnished
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
  - ☐ the claims:
    - pages \_\_\_\_\_ as originally filed/furnished
    - pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
  - ☐ the drawings:
    - pages \_\_\_\_\_ as originally filed/furnished
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
    - pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
  - ☐ the sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
  - ☐ the description, pages \_\_\_\_\_
  - ☐ the claims, Nos. \_\_\_\_\_
  - ☐ the drawings, sheets \_\_\_\_\_
  - ☐ the sequence listing (*specify*): \_\_\_\_\_
  - ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - ☐ the description, pages \_\_\_\_\_
  - ☐ the claims, Nos. \_\_\_\_\_
  - ☐ the drawings, sheets \_\_\_\_\_
  - ☐ the sequence listing (*specify*): \_\_\_\_\_
  - ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/KR2004/000760

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	9	YES
	Claims	1-8	NO
Inventive step (IS)	Claims	9	YES
	Claims	1-8	NO
Industrial applicability (IA)	Claims	1-9	YES
	Claims	NONE	NO

**2. Citations and explanations (Rule 70.7)****1) Documents cited in the International Search Report**

- D1 : Hyun-Tak Kim et al., 'Observation of Mott Transition in VO<sub>2</sub> Based Transistors'  
Online at <http://xxx.lanl.gov/abs/cond-mat/0308042>
- D2 : Hyun-Tak Kim et al., "Gate-Induced Mott Transition"  
Online at <http://xxx.lanl.gov/abs/cond-mat/0305632>
- D3 : Hyun-Tak Kim et al., ' Mechanism and observation of Mott transition in VO<sub>2</sub>-based and two- and three-terminal devices' In: New Journal of Physics, 6 (2004) 52
- D4 : "Future Trends in Microelectronics: the Nano Millennium", pp.148-155  
Ed by S. Luryi, J.M. Xu, A. Zaslavsky, Wiley Intescience, 2002
- D5 : KP 2003-0024156 A
- D6 : US 6,121,642 A

**2) Novelty and Inventive Step****Claims 1-8**

The subject-matter of claims 1-4 relates to a metal-insulator transition switching transistor comprising: a silicon substrate; a gate electrode; a metal-insulator-transition channel layer on the gate insulation film; a source; and a drain connected to both sides of the metal-insulator-transition channel layer.

Howecer, D1 discloses a VO<sub>2</sub> based transistor comprising: a silicon substrate; a gate electrode; a Mott transition channel layer(VO<sub>2</sub>) on the gate insulation film; a source; and a drain(Au/Cr) connected to both sides of the metal-insulator-transition channel layer.

So, all the features of claims 1-4 are considered to be disclosed in D1.

Therefore, the subject-matter of claims 1-4 lacks novelty under PCT Article 33(2).

-CONTINUED-

**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.  
Continuation of:

**BOX V**

The subject-matter of claims 5-8 relates to a method for manufacturing the MIT switching transistor comprising: a step for forming an gate electrode; a step for forming a gate insulation film; a step for forming a source electrode and a drain electrode; and a step for forming a channel layer between the source and drain electrodes.

But all the features of claims 5-6 are disclosed in the abstract, figure 2 and page 1~ page 2 of D1.

Therefore, the subject-matter of claims 5-8 lacks novelty under PCT Article 33(2).

And, D2 discloses a VO<sub>2</sub> based transistor comprising: an Al<sub>2</sub>O<sub>3</sub> substrate; a VO<sub>2</sub> channel layer; a gate electrode on the gate insulation film; a source; and a drain(Au/Cr) connected to both sides of the metal-insulator-transition channel layer.

The only difference between D1 and this application is the material of the substrate.

So, a skilled person also can reach the subject-matter of claims 1-8 by combining the technical features of D2 and D1, and the advantages thus achieved can readily be foreseen.

Therefore, the subject-matter of claims 1-8 does not have an inventive step under PCT Article 33(3).

**Claim 9**

The subject-matter of claim 9 has such a characteristic that VO<sub>2</sub> thin film is grown at a growth temperature in the range of 450°C to 470°C and with an oxygen flow variation in the range of 5 to 6 SCCM.

But none of the documents cited in the International Search Report refer to the above-mentioned manufacturing condition.

Therefore, the subject-matter of claim 9 is believed to be novel and to involve an inventive step under PCT Article 33(2) and 33(3).

**3) Industrial Applicability**

And the present invention has industrial applicability under PCT Article 33(4).